

REMARKS

Claims 1-7 are pending. No new matter has been added by way of the present submission. For instance, claims 1 and 5 have been amended to clarify that the acid solution is an organic acid solution having 1 to 10 carbon atoms as supported by originally filed claim 4 as well as the present specification at page 6, lines 10 to 12. Claims 1 and 5 have also been amended to include units for the BET surface area. Further, claims 1 and 5 have also been amended to clarify the dissolving of the metal salts and to use consistent Markush language in item iv) of these claims. Lastly, claim 4 has been amended to be consistent with the amendments to claim 1. Accordingly, no new matter has been added.

In view of the following remarks, Applicants respectfully request that the Examiner withdraw all rejections and allow the currently pending claims.

Objections to the Claims

The Examiner has objected to claims 1 and 5 since the units for surface area have been omitted. Applicants traverse and submit that the BET surface area of claims 1 and 5 has been amended to include units of "m²/g." Accordingly, this objection is moot. Reconsideration and withdrawal thereof are respectfully requested.

Issues under 35 U.S.C. § 112, second paragraph.

The Examiner has rejected claims 1-7 under 35 U.S.C. § 112, second paragraph for the reasons recited at page 2 of the outstanding Office Action. Applicants respectfully traverse this rejection.

The Examiner has asserted that claims 1 and 5 employ improper Markush language with respect to the "salt of a metal." Applicants submit that proper Markush language has been adopted in section "iv" of claims 1 and 5. Also, Applicants wish to clarify that the metal salts used, for instance, in step a) of claim 1 means that all of i), ii), iii), iv) and v) are used to prepare the catalyst suspension. Accordingly, this rejection is moot. Reconsideration and withdrawal thereof are respectfully requested.

Issues under 35 U.S.C. §103(a)

The Examiner has rejected claims 1-4 and 6 under 35 U.S.C. §103(a) as being obvious over Krabetz et al., U.S. Patent No. 4,259,211 (hereinafter referred to as Krabetz '211) in view of Khoobiar, U.S. Patent No. 4,271,040 (hereinafter referred to as Khoobiar '040). Applicants respectfully traverse this rejection.

The Present Invention and Its Advantages

Independent claim 1 relates to a method for preparing a catalyst for partial oxidation of acrolein represented by Chemical Formula 1 having a BET surface area of 4 to 15 m²/g. The method includes a step of dissolving the following metal salts: i) a molybdenum salt, ii) a tungsten salt, iii) a vanadium salt, iv) a salt of a metal selected from the group consisting of iron, copper, bismuth, chromium, tin, antimony, and potassium, and v) a salt of an alkaline earth metal in water to prepare a catalyst suspension. Then, a base solution and an acid solution are introduced into the catalyst suspension to control acidity of the catalyst suspension to a pH of 3.5 to 6.5. The acid solution is an organic acid solution having 1 to 10 carbon atoms. Then, the

catalyst suspension of which acidity is controlled is contacted with an inert support to support the catalyst thereon and the supported catalyst is dried and fired.

As will be discussed below, various limitations according to the present claims are completely absent from the prior art. Moreover, these particular limitations result in superior properties according to the present invention.

Distinctions Between the Present Invention and the Cited Art

Independent claim 1 is discussed above. A review of the cited art reveals that even when taken in combination, the references fail to suggest or disclose the presently claimed invention. In particular, the references are both deficient in at least the following discussed limitations according to the present claims.

1. In the claimed invention, the pH of the catalyst suspension obtained by step a) is controlled to the range of 3.5 to 6.5.

Generally, in preparing a metal oxide catalyst by a conventional precipitation method, it is difficult to obtain minute metal particles. Consequentially, it is also difficult to obtain a metal catalyst having the large surface area, for instance a surface area over 4 m²/g. However, in the present invention, by controlling the pH to 3.5 to 6.5, the particle size of the catalyst suspension is considerably reduced.

According to the present invention, when the pH is lower than the range required by the present claims, no metal precipitation is obtained. Further, when the pH is higher than the range required by the present claims, the particle size of the catalyst suspension is increased. Moreover, in the claimed invention, due to the reduced particle size, the surface area of the

particles of the catalyst suspension is larger. This results in an increase of the catalyst reactivity of the catalyst. In this regard, the Examiner is requested to refer to the present specification, for instance, page 6, line 3 to page 7, line 1.

In contrast, neither Krabetz '211 nor Khoobiar '040 suggest or disclose the presently claimed pH range for the catalyst suspension. Accordingly, there exists no *prima facie* case of obviousness for at least this reason. Moreover, even if the Examiner has hypothetically established a *prima facie* case of obviousness, a point not conceded by Applicants, the presently claimed subject matter achieves superior results compared to the prior art. For instance, since neither reference was aware of the presently claimed pH range, it is not surprising that they were also unaware of the advantages obtained by such pH control as presented in the claimed invention. Thus, the advantages of the present invention are totally unexpected. Accordingly, any hypothetical *prima facie* case of obviousness is moot.

2. In the claimed invention, the pH of the catalyst suspension obtained by step a) is controlled by introducing a base solution and an organic acid solution having 1-10 carbon atoms.

The above distinctions are enough to establish patentability of the present invention over the cited art. However, Applicants further draw the Examiner's attention to an additional distinction concerning the present organic acid used to control the pH of the catalyst suspension. The organic acid used in the claimed invention is released from the catalyst particles during drying and firing, to make many pores, also contributing to increase the surface area of the catalyst. Applicants draw the Examiner's attention to the fact that the organic acid has 1 to 10 carbon atoms.

However, the cited art is completely silent concerning controlling the pH of the suspension by adding a base solution and the specific acid solution according to the present claims. Moreover, due to this failure, the cited art also fails to recognize the advantages obtained thereby.

3. In the claimed invention, the BET surface area of the obtained catalyst ranges from 4 to 15 m²/g.

As discussed above, in preparing a metal catalyst using conventional methods, it has been difficult to obtain a catalyst having a surface area over 4 m²/g. However, in the presently claimed invention, a catalyst having such a large surface area (4 to 15 m²/g) is obtained by controlling the pH to 3.5 to 6.5 and using an organic acid to control the pH. By way of this process, considerably improved catalyst reactivity is achieved.

Concerning the BET surface area, the Examiner has asserted that it is expected that the catalysts of the cited art would possess the same BET surface area because the same catalyst precursor having the same chemical formula is disclosed. Applicants respectfully disagree with the Examiner's reasoning. The BET surface area is not determined by the chemical formula of the catalyst precursor, but rather by the particle size. Therefore, the BET surface area of the claimed invention is neither suggested nor inherently practiced by the cited art.

4. In the claimed invention, an alkaline earth metal salt is used in preparing the catalyst.

By using the alkaline earth metal salt of the present invention in the claimed subject matter, the electronic structure of the catalyst is altered. This results in improvement of the selectivity of the catalyst. However, neither Krabetz '211 nor Khoobiar '040 suggest or disclose

this aspect of the present invention. Thus, the present invention is non-obvious for this additional reason.

In view of the above, Applicants respectfully submit that the Examiner has failed to present a valid *prima facie* case of obviousness. In the alternative, any hypothetical *prima facie* case of obviousness is moot in view of the unexpectedly superior results achieved by the present invention. Accordingly, the Examiner is respectfully requested to withdraw this rejection.

Issues under 35 U.S.C. §§102(b)/103(a)

The Examiner has rejected claims 5 and 7 under 35 U.S.C. §102(b) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as being obvious over Krabetz '211. Applicants respectfully traverse this rejection. Each of the above distinctions applies to the rebuttal of the present rejection. However, Applicants draw the Examiner's attention to the following particular details.

Independent claim 5 of the present invention relates to a catalyst for partial oxidation of acrolein. The catalyst of claim 5 has a BET surface area of 4 to 15 m²/g. As already discussed above, Krabetz '211 fails to suggest or disclose preparation of a catalyst being defined by such a limitation. In preparing a metal catalyst using conventional methods, it has been difficult to obtain the catalyst having a surface area over 4 m²/g. In the presently claimed invention, a catalyst having a large surface area (4 to 15 m²/g) is obtained by controlling the pH to 3.5 to 6.5 and using by an organic acid to control the pH. By way of this process, considerably improved catalyst reactivity is achieved. This is a physical attribute of the present product not achieved by the prior art.

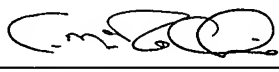
Moreover, the Examiner has asserted that the present BET surface area is expected to be achieved by Krabetz '211 because the same catalyst precursor having the same chemical formula is disclosed. However, the BET surface area is not determined by the chemical formula of the catalyst precursor, but rather by the particle size. Therefore, the BET surface area of the claimed invention is neither suggested nor inherently practiced by Krabetz '211. Accordingly, this rejection is improper and should be withdrawn.

In view of the above, Applicants respectfully submit that the present claims define allowable subject matter. Accordingly, the Examiner is respectfully requested to withdraw all rejections and allow the currently pending claims.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under § 1.17; particularly, extension of time fees.

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Respectfully submitted,

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